

NATURAL HISTORY OF PLUMMERS ISLAND,
MARYLAND. XXVII. THE DECLINE OF FOREST
BREEDING BIRDS ON PLUMMERS ISLAND,
MARYLAND, AND VICINITY

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Abstract.—Breeding birds at five deciduous forest sites in the Washington, D.C. area have experienced alarming declines in recent decades. On Plummers Island and the adjacent mainland, 61% of the breeding species were lost over 50 years, and from 1943 to 1984 breeding populations declined 38% from 134 pairs to 83.5 pairs. For four other sites in the area, long-term breeding density losses ranged from 7% to 68%. Average losses of 0.5 species and 4.3 breeding pairs per year were calculated from the four sites. Significant among these losses were Neotropical migrants, but at most sites declines were also noted in the resident and short-distance migratory species. Similar trends have been detected in long-term studies at several other deciduous forest sites in North America. Additional patterns are reported from the Washington area sites: (1) over the years Neotropical species have been lost gradually, not abruptly, and (2) for individual species, losses have occurred in different years on different sites despite their proximity. Causes of the declines are briefly discussed, with a special focus on vehicular disturbance as a contributing factor on Plummers Island.

Accelerating tropical deforestation, the increasing widespread loss of biological diversity, and forest fragmentation in North America have attracted the attention of systematists, ecologists, conservationists, and decision-makers in recent years. Because birds are conspicuous members of forest communities, breeding bird populations are often used as indicators of forest vitality and stability both in North America and the Neotropics (Aldrich and Robbins 1970). Only by using long-term data sets, however, can bird population trends be accurately identified and critically analyzed; only in recent years have such long-term sets been available. In the greater Washington, D.C. area, near the Potomac River from the vicinity of the Capital Beltway (I-495) in Virginia and Maryland to well inside the District of Columbia (Fig. 1), breeding birds have been censused in five deciduous forest

sites over periods of years ranging from 14 to 41. The present paper is an analysis of the data from these long-term censuses with an emphasis on Plummers Island, Maryland, where observations extend back to 1935 and before (Fisher 1935). Consideration is given to the dramatic loss of Neotropical migrants and the changing populations of resident birds.

Sites and methods.—On Plummers Island (PI) and the adjacent mainland (Site 2, Fig. 1) immediately east of the Cabin John Bridge, a characteristic floodplain forest is dominated by cottonwoods (*Populus deltoides*) and sycamores (*Platanus occidentalis*). This lowland forest grades into an upland forest dominated by oaks (*Quercus velutina*, *Q. borealis*), hickories (*Carya glabra*, *C. tomentosa*), tulip-tree (*Liriodendron tulipifera*), and other deciduous species. When Fisher (1935) and Aldrich and Duvall

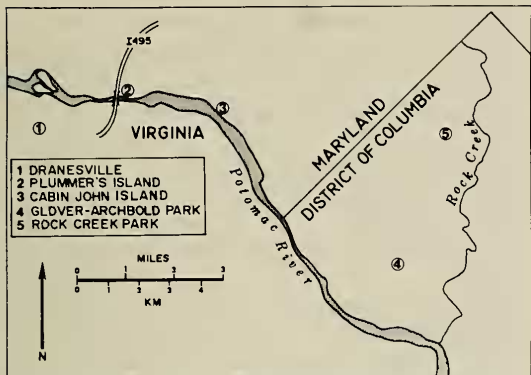


Fig. 1. The location of breeding bird census sites in the Washington, D.C. area.

(1943) reported on the birds here, the main-land portion of the site contained a 7-acre old field which subsequently experienced characteristic succession from grassland to young scrub pine (*Pinus virginiana*) (Fig. 2). By 1984, the field had long since been replaced by a forest community dominated by tulip-tree. Data used for this site in the present analysis include Fisher's descriptive report (1935) of breeding birds up to 1935, a breeding bird census by Aldrich and Du-

vall (1943), and our census in 1984. The total census area (island and mainland in Fig. 2) was approximately 50 acres.

Dranesville District Park (DR) (Site 1), formerly known as Burling Park, has been described as an immature oak-hickory hardwood forest (Mainland 1971), also dominated at that time by tulip-tree and several species of oaks with an understory of hickories. The census area of 27.2 acres is a virtually uniform forest surrounded by 200 acres of similar habitat. Although 14 consecutive years of censuses are available (begun in 1972), 1972 was a year of inadequate coverage, so our analysis of the Dranesville data set begins with 1973.

Cabin John Island (CJ) (Site 3) was described in detail (Anonymous 1947) as "a mature deciduous floodplain forest . . . about 100 years old," dominated then by sycamore, American elm (*Ulmus americana*), tulip-tree, black walnut (*Juglans nigra*), and other hardwoods. From the census area of 18.75 acres, 34 censuses have been published between 1947 and 1986.

The Glover-Archbold Park (GA) site (Site

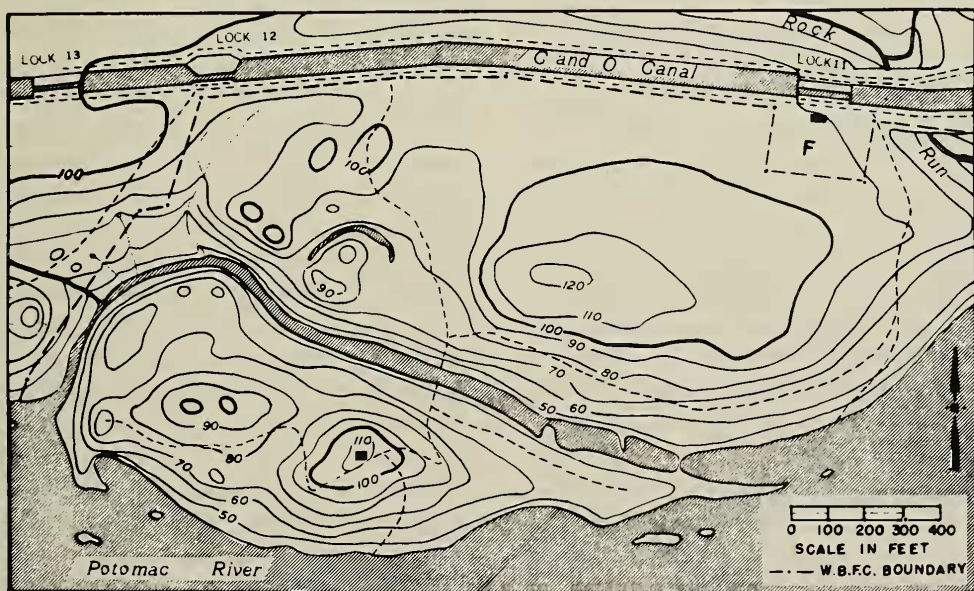


Fig. 2. The Plummers Island and adjacent mainland census site. F marks the location where the old field once existed. Map courtesy of the Washington Biologists' Field Club.

Table 1.—Breeding bird censuses on Plummers Island, 1943 and 1984. Figures are for pairs or territorial males on the 50-acre site.

	1943	1984
Red-eyed Vireo (<i>Vireo olivaceus</i>)	15	13.5
Kentucky Warbler (<i>Oporornis formosus</i>)	11	0
Northern Cardinal (<i>Cardinalis cardinalis</i>)	9	12.5
Acadian Flycatcher (<i>Empidonax vireescens</i>)	9	6
Carolina Wren (<i>Thryothorus ludovicianus</i>)	7	8
Field Sparrow (<i>Spizella pusilla</i>)	6*	0
Northern Parula (<i>Parula americana</i>)	6	4
Wood Thrush (<i>Hylocichla mustelina</i>)	5	0
American Redstart (<i>Setophaga ruticilla</i>)	5	0
Prairie Warbler (<i>Dendroica discolor</i>)	4*	0
Common Yellowthroat (<i>Geothlypis trichas</i>)	4*	0
Scarlet Tanager (<i>Piranga olivacea</i>)	4	1
Yellow-throated Vireo (<i>Vireo flavifrons</i>)	3	0
Great Crested Flycatcher (<i>Myiarchus crinitus</i>)	3	2.5
Tufted Titmouse (<i>Parus bicolor</i>)	3	2
European Starling (<i>Sturnus vulgaris</i>)	3	1
Indigo Bunting (<i>Passerina cyanea</i>)	3*	2
American Goldfinch (<i>Carduelis tristis</i>)	2*	1
Song Sparrow (<i>Melospiza melodia</i>)	2	2
Yellow-breasted Chat (<i>Icteria virens</i>)	2*	0
Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)	2	0
Carolina Chickadee (<i>Parus carolinensis</i>)	2	6.5
White-breasted Nuthatch (<i>Sitta carolinensis</i>)	2	1
Red-bellied Woodpecker (<i>Centurus carolinus</i>)	2	2.5
Eastern Phoebe (<i>Sayornis phoebe</i>)	2	1
Mourning Dove (<i>Zenaidra macroura</i>)	2*	0
Bobwhite (<i>Colinus virginianus</i>)	2*	0
Eastern Wood-Pewee (<i>Contopus virens</i>)	1	6
American Robin (<i>Turdus migratorius</i>)	1	0
Eastern Bluebird (<i>Sialia sialis</i>)	1	0
Common Grackle (<i>Quiscalus quiscula</i>)	1	1
American Crow (<i>Corvus brachyrhynchos</i>)	1	1
Blue Jay (<i>Cyanocitta cristata</i>)	1	1

Table 1.—Continued.

	1943	1984
Gray Catbird (<i>Dumetella carolinensis</i>)	1	0
Ovenbird (<i>Seiurus aurocapillus</i>)	1	0
Rufous-sided Towhee (<i>Pipilo erythrophthalmus</i>)	1*	0
Downy Woodpecker (<i>Picoides pubescens</i>)	1	1.5
Ruby-throated Hummingbird (<i>Archilochus colubris</i>)	1	0
Yellow-billed Cuckoo (<i>Coccyzus americanus</i>)	1	0
Barred Owl (<i>Strix varia</i>)	1	1
Spotted Sandpiper (<i>Actitis macularia</i>)	1	0
Northern Oriole (<i>Icterus galbula</i>)	0	1
Hairy Woodpecker (<i>Picoides villosus</i>)	0	2.5
Prothonotary Warbler (<i>Protonotaria citrea</i>)	0	1
House Finch (<i>Carpodacus mexicanus</i>)	0	1
Total breeding pairs or territorial males	134	83.5

* Species found in old field.

4) is a 35-acre upland deciduous forest, described by Briggs (1960) as "about 100 years old" and dominated by beech (*Fagus grandifolia*), tulip-tree, and several species of oaks and maples (*Acer* spp.). From 1959 to 1986, 25 censuses have been published.

The Rock Creek Park (RC) census site (Site 5) was originally 80 acres but was reduced to 65 acres in 1963. It was described (Anonymous 1948) as a "hardwood forest with scattered pine" dominated by tulip-tree, oaks (*Q. alba*, *Q. prinus*), other hardwoods, and some scrub pine. From 1948 to 1986, 29 censuses have been published.

Censuses from these last four sites have been published in "The Wood Thrush," "Atlantic Naturalist," and "American Birds." None of the published, annual census analyses provide information on any substantial habitat changes within the sites since the original habitat descriptions were published.

Table 2.—Summary of breeding bird population data, Plummers Island and the adjacent mainland, 1935–1984.

Breeding birds	Up to 1935	1943	1984
Species richness	67	41	26
No. Neotropical species	28	18	9
No. resident/short-distance migrant species	39	23	17
Density (pr./100 acres)			
a. Neotropical species	—	154	74
b. Resident/s-d. migrants	—	114	93

Although some census-takers have changed at these sites over the years, techniques for censusing the breeding birds have generally followed the widely used spot-mapping/singing-male/territory-mapping technique described by Williams (1936) and discussed in detail in Ralph and Scott (1981).

Results.—For Plummers Island and the adjacent mainland, Fisher (1935) listed 67 breeding species recorded up to that time. Of these, 39 were resident and/or short-distance migrants (57%), whereas 28 were Neotropical species (43%). The census in 1943 by Aldrich and Duvall showed that 26 species had been lost from the breeding population, and, by 1984, the total species richness was further reduced from 41 to only 26, nine (35%) of which were Neotropical species (Tables 1, 2). Thus, in a span of about 50 years, 61% of the formerly breeding species were no longer found at this site. Over the 50-year period the reduction of 68% in species richness of Neotropical birds was paralleled by an equally alarming decline (56%) of resident and/or short-distance migrant species. Some of the species losses can undoubtedly be attributed to habitat changes associated with old-field succession described above. For example, of the nine species breeding in or near the small field in 1943, all except the Indigo Bunting and American Goldfinch were gone by 1984, and the few remaining pairs of these two species bred only at the edge of the study site along the Potomac River.

Table 3.—Long-term breeding bird data for five deciduous forest sites in the Washington, D.C., area.

Site	Species richness	Pairs/100 ac. (mean loss per yr.*)	Percent* resident or short- distance migrant species	Percent* Neotropical migrant species
Plummers Island				
1943	41	268	35	65
1984	26	167 (2.5)	54	46
Cabin John				
1947	30	608	41	59
1986	24	344 (6.8)	69	31
Rock Creek Park				
1948	29	233	15	85
1986	25	74 (4.2)	58	42
Glover-Archbold				
1959	39	570	47	53
1986	30	529 (1.5)	69	31
Dranesville				
1973	25	327	58	42
1986	19	261 (4.7)	52	48

* Of pairs/100 ac.

Between 1943 and 1984, population density losses at the Plummers Island site were high for Neotropical species (51%) but less for the residents (18%), the latter decline being offset somewhat by small increases in the Northern Cardinal, Carolina Wren, and Carolina Chickadee. Major population and species losses for Neotropical migrants over the last 41 years included the Kentucky Warbler (11 pr. to 0), Wood Thrush (5 to 0), Yellow-throated Vireo (3 to 0), Blue-gray Gnatcatcher (2 to 0), and others (Table 1).

Analysis of the long-term data sets from the other four sites reveals some notable parallels and a few differences when compared to the PI data (Table 3). PI had a decrease in species richness of 37% in 41 years; for the other four sites, decreases in species were: 14% (RC, 39 yr), 20% (CJ, 34 yr), 23% (GA, 25 yr), and 24% (DR, 14 yr). The mean loss in species richness over the four sites was 0.5 species per year. Population density changes, on the other hand, differed widely among the sites, from 7%

(GA) and 20% (DR) to 43% (CJ) and 68% (RC), compared with 38% on PI. The mean loss over the four sites was 4.3 breeding pairs per year (on a 100-acre basis). Examination of each year's census revealed the fact that declines in total breeding pairs apparently began at different times at the different sites—about 1964 (RC), 1972 (CJ), and 1976 (GA). These analyses are in general agreement with the detailed reports for these three sites (CJ, RC, GA) discussed by Criswell (1975) and Briggs and Criswell (1986).

Focusing on the ten species with the highest initial densities at each of the sites, species showing the greatest density losses were the Red-eyed Vireo, Kentucky Warbler, Acadian Flycatcher, Northern Parula, Wood Thrush, and American Redstart, all Neotropical migrants. Interestingly, some resident species had small increases on most of the sites, e.g., Northern Cardinal, Carolina Wren, Carolina Chickadee, and Tufted Titmouse.

Discussion.—Long-term studies of breeding birds from specific sites in North American deciduous forests date back to 1923. From 1923 to 1947, breeding bird populations in one Michigan (Walkinshaw 1947) and two Ohio (Williams 1947, Preston 1960) forests showed no apparent population trends. However, the 50-year study by Kendeigh (1982) in Illinois showed a gradual increase in breeding bird density from 1927 to a peak about 1960, after which a modest decline continued through 1976. In the Illinois study, Neotropical species peaked in 1950 as 50% of the total breeding population, then decreased to only 27% by 1976. A 23-year study in Connecticut revealed a slightly increasing population from 1953 until 1964, followed by a dramatic decline beginning about 1970 (Butcher et al. 1981). Over a 16-year period from 1969 to 1984, populations in a New Hampshire forest declined steadily from 640 breeding adults to 360/100 acres with the most notable losses occurring after 1977 (Holmes et al. 1986).

Combining the analysis of these long-term trends with those from the deciduous forest sites summarized here for the Washington area, several general patterns are evident (Table 3). (1) Declines became evident at most sites after 1960 for total breeding bird densities and Neotropical species. (2) For individual species showing declines, especially the Neotropical ones, population densities gradually decreased year by year often down to a single pair. Subsequently, over the next few years, the species was often reported as an unmated or single territorial male, then as a "+" or "visitor." These latter designations usually meant that only one bird was seen once or twice on the census area but without any evidence of territoriality. Rarely did a species "return" as a breeding pair after an absence of several years, but such instances did occur with the Yellow-throated Vireo (CJ), Hooded Warbler (RC), and Prothonotary Warbler (PI). This general pattern is reported here because it strongly suggests that Neotropical species have decreased gradually and not abruptly in the breeding populations. (3) From these long-term census data, another pattern of decrease is apparent at least for the Neotropical migrants in the Washington area. Because of some differences in vegetational composition, physiography, and microclimate among these four sites, one might expect that individual species would be lost at different times. And the data support this pattern. For example, the last breeding pair of American Redstarts was found in 1973 (RC), 1974 (GA), and 1981 (CJ). For the Kentucky Warbler, a different temporal pattern of loss was evident: 1961 (RC), 1965 (CJ), 1970 (GA), and 1978 (DR). And for the Hooded Warbler, the data are: 1960 (GA), 1969 (RC), and 1978 (DR). Thus, individual Neotropical migrant species have disappeared as breeding birds in different years at the different sites despite the proximity of the sites.

Although breeding densities have declined at all five sites in recent decades, es-

pecially for the Neotropical species, some individual resident species as noted above have shown small but reasonably consistent increases. We hypothesize two explanations for these increases, the hypotheses not being mutually exclusive. Given the likelihood of reduced competition for environmental resources with the decrease of Neotropical birds, the remaining resident species could have expanded their ecological niches with a consequent increase in breeding potential. Secondly, it is also possible that during the nonbreeding season some of the resident species move into contiguous habitats where they find supplemental food resources at feeding stations. Such additional resources could conceivably reduce overwinter mortality, thus also increasing the breeding potential.

The causes of species and population declines are complex and have recently been attributed to a variety of factors, including forest fragmentation in North America (Whitcomb 1986), deforestation in the American tropics (Terborgh 1980), and the effects of Brown-headed Cowbird (*Molothrus ater*) parasitism (Brittingham and Temple 1983). Our study does not directly address these hypotheses from a cause-and-effect standpoint. However, a correlation might exist between our reported declines of breeding Neotropical migrants and accelerating deforestation in the Neotropics, a correlation also developed by several authors in Keast and Morton (1980). At least for PI, our field observations specifically suggest that human disturbance was a causal factor in population declines of some species, in addition to the successional factor discussed above. Vehicular traffic passing over the Cabin John Bridge (completed about 1962) immediately adjacent to the study area produces a deafening (to humans) noise level that could affect breeding birds at that portion of the study site despite the fact that the habitat has shown no appreciable change since then. In fact, for species still breeding on the study area in 1984, in the forest hab-

itat immediately adjacent to the bridge 10 species showed a total reduction (1943–1984) from 11 to 6 territories.

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